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ABNORMAL FLOWER STRUCTURE IN *OXALIS STRICTA* L.

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(Plate 122.)

WHILE collecting flowers for class use one day in the autumn of 1915 the attention of the writer was attracted by the peculiar appearance of one or two plants of *Oxalis stricta* L. Curiosity as to the nature of this peculiarity led to a closer examination, which revealed the fact that it was due to the replacement of normal flowers by various abnormal developments and in part to the reduction in size of the leaves, which were also decidedly paler than ordinary leaves.

Henri Hus (1907) has described a variant form of *Oxalis stricta* having green petals and somewhat smaller fruits. This form he named *Oxalis stricta viridiflora*. The petals of this form, in addition to the difference in color, differ in shape, width, distribution of the vascular bundles, as also in the shape of the epidermal cells, in the absence of ridges in the latter, number of stomata, and in the number and kinds of hairs present. Bartlett (1909) also reports the occurrence of *Oxalis stricta viridiflora* which, as in specimens described by Hus, differ from normal flowers of *Oxalis stricta* only in the petal characters.

None of the specimens found by the writer possessed the green petals described by Hus (1907) and Bartlett (1909). The sepals and pistils also were distinctly different from those described by either Hus or Bartlett.

Various degrees of abnormality were found, ranging from an almost normal condition to such wide departures from it that they bore little resemblance to flowers. The sepals of normal flowers are narrow and

linear to oblong in form, measuring about 4×1 mm. (fig. 1). Those of the abnormal flowers were broadly obovate and obcordate at the apex, measuring 3.2×3.0 mm. (fig. 2). In shape and vein-arrangement they closely resemble a leaflet of a foliage leaf (fig. 3). Sepals of this form occurred in all the abnormal flowers regardless of other peculiarities that were exhibited.

The sepals of abnormal flowers are pubescent on the back with appressed hairs as in normal flowers, the hairs being mostly of the unicellular, thick-walled type, as described by Hus ('07:102). They differ from foliage leaves in the amount of pubescence, that on the leaves being rather sparse and confined to the under side. The cells of the sepals of abnormal flowers are less elongated than in normal flowers but never as nearly isodiametric as those of the leaves so that the sepals of the abnormal flowers, while strongly suggesting foliage leaves in outline and arrangement of veins, still retain a closer resemblance to normal sepals in the amount and kind of pubescence and in cell-characters.

The petals were not uniform in shape in all the abnormal specimens. Instead of being obovate to obcuneate and yellow as in normal specimens (fig. 4), most of them were reduced to narrow, linear or oblong, pale yellow or whitish structures. One of the most extreme forms is shown in figure 6. This specimen had petals which were nearly orbicular, about 3 mm., in diameter and with a slender claw of about the same length. Others varied between the linear petals (fig. 5) and the normal shape (fig. 4).

The vein-arrangement and shape of cells in petals of the abnormal specimens were similar to those of normal ones except that the epidermal cells at the tips of the petals did not have the ridges projecting into the cell as is true of the epidermal cells at the tips of normal petals.

The stamens as in normal flowers, were of two lengths, the inner series being the longer. They differed from stamens of normal flowers however, in that in all cases they were separate instead of monadelphous. In some specimens the stamens were apparently normal except for being separate. In others the anthers of the inner series were either poorly developed or entirely wanting. The anthers of the outer series were apparently normal. In one specimen part of the stamens had been transformed into narrow, petaloid structures. No examination of the pollen from any of the specimens was made.

The pistil showed the most varied and peculiar structures. In

normal flowers the pistil is columnar, sharply 5-angled and measuring usually 16–18 mm. in length. In most of the variant forms examined the pistil was much smaller than in normal flowers and in many specimens more or less twisted and distorted. The smaller pistils were obpyriform in shape, with the lobes or divisions usually strongly rounded on the back and only in a very few specimens sharply angled as in normal flowers. Development of seeds in any abnormal specimens was not observed.

Most of the specimens found were of the kind shown in figures 7, 8 and 9. These flowers were the nearest approach to the usual type. The sepals were broadly ovate and leaf-like. The petals differed only in being narrower, shorter and very pale in color. The stamens differed from normal ones in being separate. The anthers of the outer series were apparently normal while those of the inner series were poorly developed or entirely lacking. The smallest flower measured only 3 mm. in diameter with a pistil less than 1 mm. in height. Most of the smaller flowers (fig. 9) measured 5–6 mm. in diameter with pistils 1.5–2 mm. in height. The larger forms measured 7–8 mm. in diameter with pistil about 4 mm. high. A few specimens had sharply angled pistils (fig. 7), thus resembling most nearly the form of the pistil in normal flowers. The pistil of the specimen shown in figure 9 was obpyriform and sharply angled, in these respects being intermediate between the specimens shown in figures 7 and 8, but smaller than either of them.

Two flowers (figs. 10 and 11) had enlarged, obpyriform or balloon-shaped pistils, the carpels being partly separate at the apex so that the interior of the ovary could be observed. No ovules were present in these specimens. The sepals and stamens of these flowers were as above described. The petals were rather longer than in most specimens and narrowly obcuneate.

A more extreme variation in the pistil form was observed in several flowers (figs. 12, 13 and 15). In these the carpels appeared as separate parts, outspread so as to resemble the petals of a flower. This condition might be produced from a form such as is shown in figures 10 and 11 by having the carpellary leaves become separated to the base and changed from a vertical to a horizontal position. Inside the carpellary leaves are small leaf-like structures which apparently replace the ovules of a normal ovary.

The specimens shown in figures 14 and 16 were the most interesting

of the series. The sepals were broadly obovate as described in the other forms. The petals were narrowly oblong. Some of the stamens had been transformed into narrowly linear petaloid structures while others were anther-bearing and apparently normal. The pistil did not appear as in other forms described but in its place was found a proliferation of the floral axis producing at the base five oboval, emarginate leaves with very short petioles and culminating at the apex in three leaves of three leaflets each. The leaflets are shown still folded together in the illustration. The condition most closely approaching this was found in the specimens shown in figures 12, 13, and 15, where the carpels have been transformed into leaves, retaining more or less of a cup shape, but without any evident elongation of the floral axis such as had occurred in the specimens last described.

Masters (1869) and Penzig (1890) cite instances of phyllomorphy of floral parts and median proliferation in many kinds of flowers. Phyllody of the carpels and ovules is known to occur in many plants. Masters ('69: 259) refers to the occurrence of petalody of the stamens in *Oxalis* but apparently no case of the peculiar modifications of the flowers of *Oxalis stricta* as described in this article has ever before been reported. No explanation is offered for the abnormalities described.

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EXPLANATION OF PLATE 122.

Fig. 1. A sepal of a normal flower, $\times 33$. Fig. 2. A sepal of an abnormal flower, $\times 33$. Fig. 3. One leaflet of a foliage leaf, $\times 7$. Fig. 4. A petal of a normal flower, $\times 33$. Fig. 5. A petal of an abnormal flower of the type shown in fig. 15, $\times 36$. Fig. 6. The usual form of the petals of abnormal flowers, $\times 33$. Figs. 7 and 8. Abnormal forms of most frequent occurrence, $\times 33$. Fig. 9. A small abnormal flower without stamens or petals, $\times 33$. Figs. 10 and 11. Abnormal flowers with inflated and partly opened pistils, $\times 33$. Figs. 12, 13, and 15. Forms with the carpellary leaves separate and outspread, the ovules replaced by small leaf-like structures, $\times 33$. Figs. 14 and 16. Forms showing phyllomorphy of the carpels and median proliferation, $\times 33$.

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